A NEW METHOD OF EXCISION OF THE KNEE WITHOUT OPENING THE JOINT.[1]

BY CARLETON P. FLINT, M.D.,
OF NEW YORK,
Attending Surgeon to the Lincoln Hospital; Chief of Surgical Clinic, Roosevelt Hospital, Out-Patient Department; Instructor in Surgery at the College of Physicians and Surgeons of New York City.

From the Surgical Department of the College of Physicians and Surgeons of Columbia University.

EXCISION of the knee for tuberculous disease is an operation associated with numerous disadvantages.

Tuberculous material is smeared more or less over the wound; often an unavoidable occurrence, which becomes especially dangerous should there already exist some secondary infection at the time of operation. The danger of tuberculous infection of the wound needs but to be mentioned; neither is it necessary to emphasize what the effects of secondary infection might be.

The diseased synovial membrane and other joint structures are frequently extremely vascular, so that the act of excising these tissues is sometimes combined with annoying hemorrhage. The perpetual clamping of small bleeding points prolongs an operation which even under the most favorable circumstances demands considerable time. One does not like to use a tourniquet for any length of time, because of the effect on the nerve supply of the leg and the related subsequent oozing, often very annoying.

This time element is quite important in cachectic and feeble patients.

Any method of resection which depends in part for its success upon complete removal of all diseased tissue after opening the joint is occasionally going to fail because some small

---

[1] Read before the New York Academy of Medicine, Surgical Section, December 1, 1905.

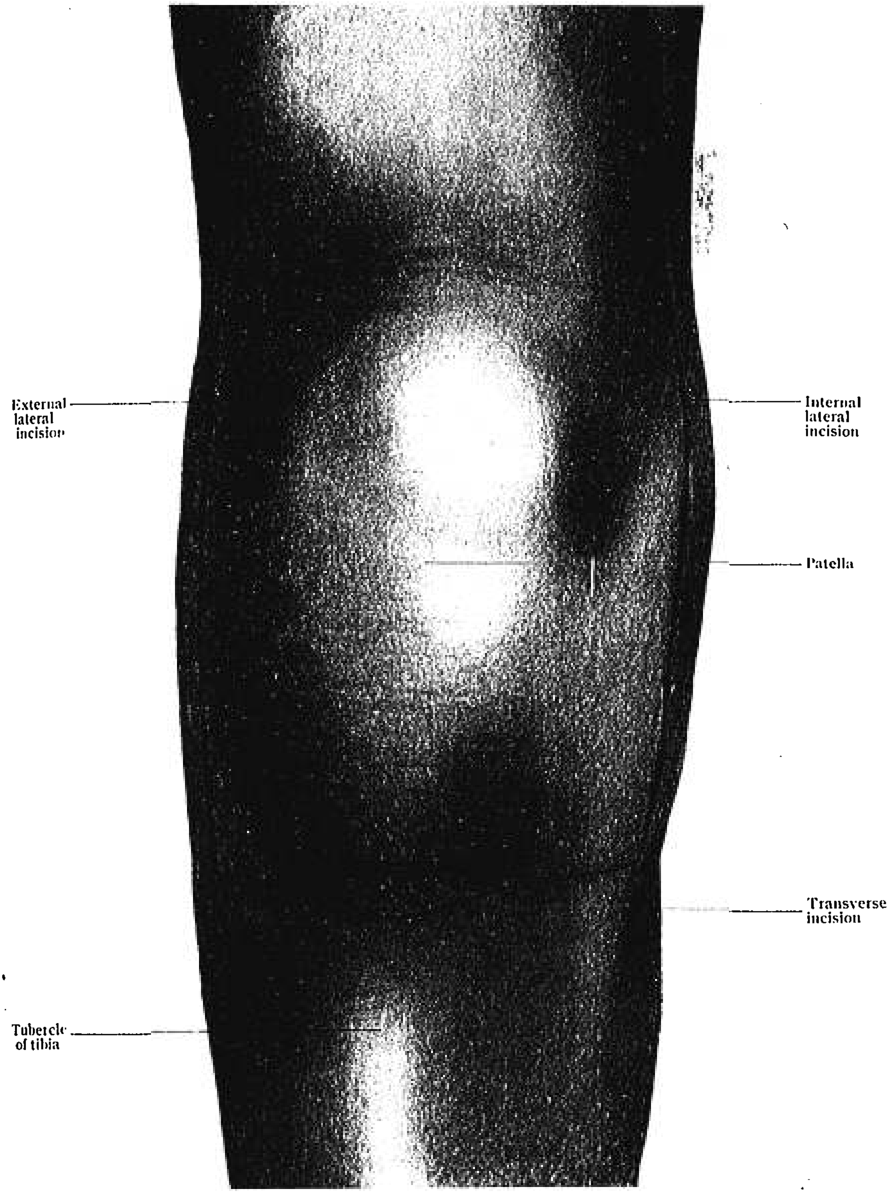

FIG. 1.—Showing square skin incision.

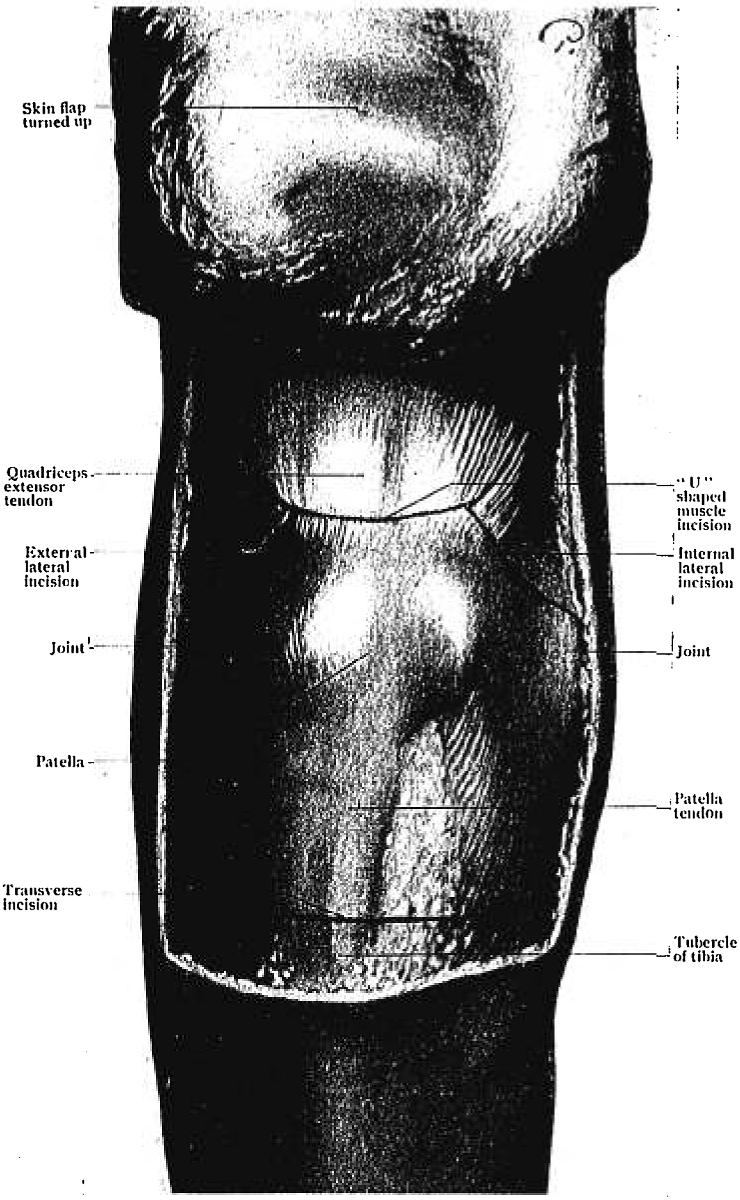
Skin flap turned up
Quadriceps extensor tendon
External lateral incision
Joint
Patella
Transverse incision
"U" shaped muscle incision
Internal lateral incision
Joint
Patella tendon
Tubercle of tibia

FIG. 2.—"U" shaped incision in quadriceps extensor. Internal and external lateral incisions in fascial expansions of quadriceps. Transverse incision over head of tibia.

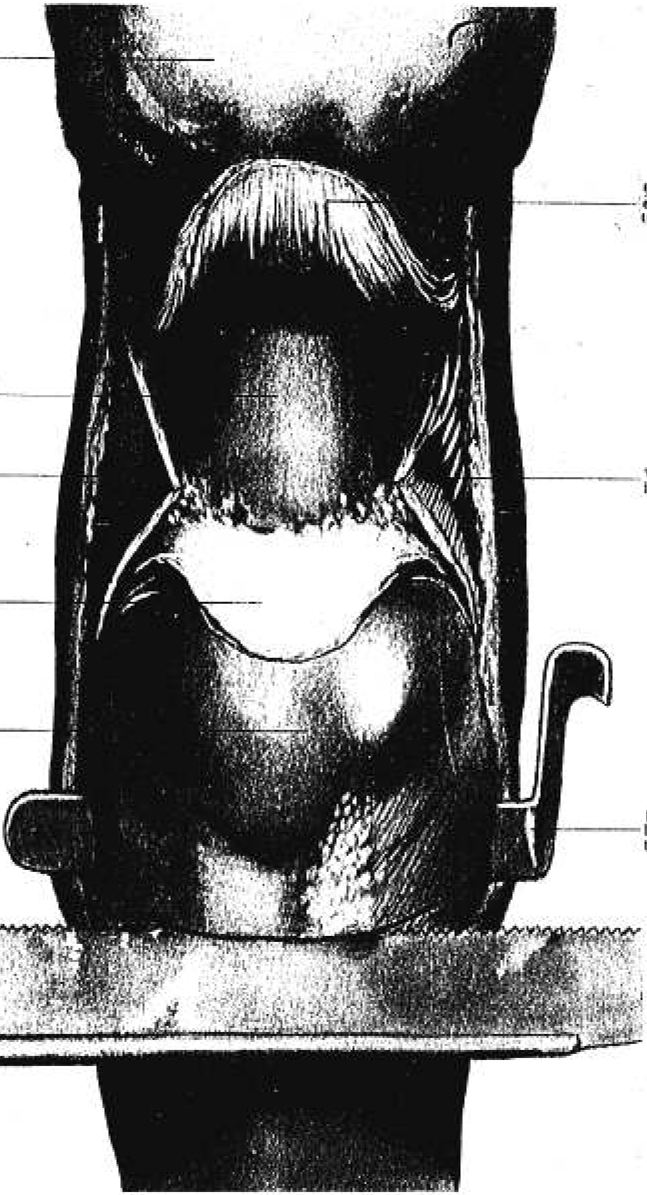

FIG. 3.—Muscle incisions. Bursa turned down. Retractor in place. Saw cutting tibia.

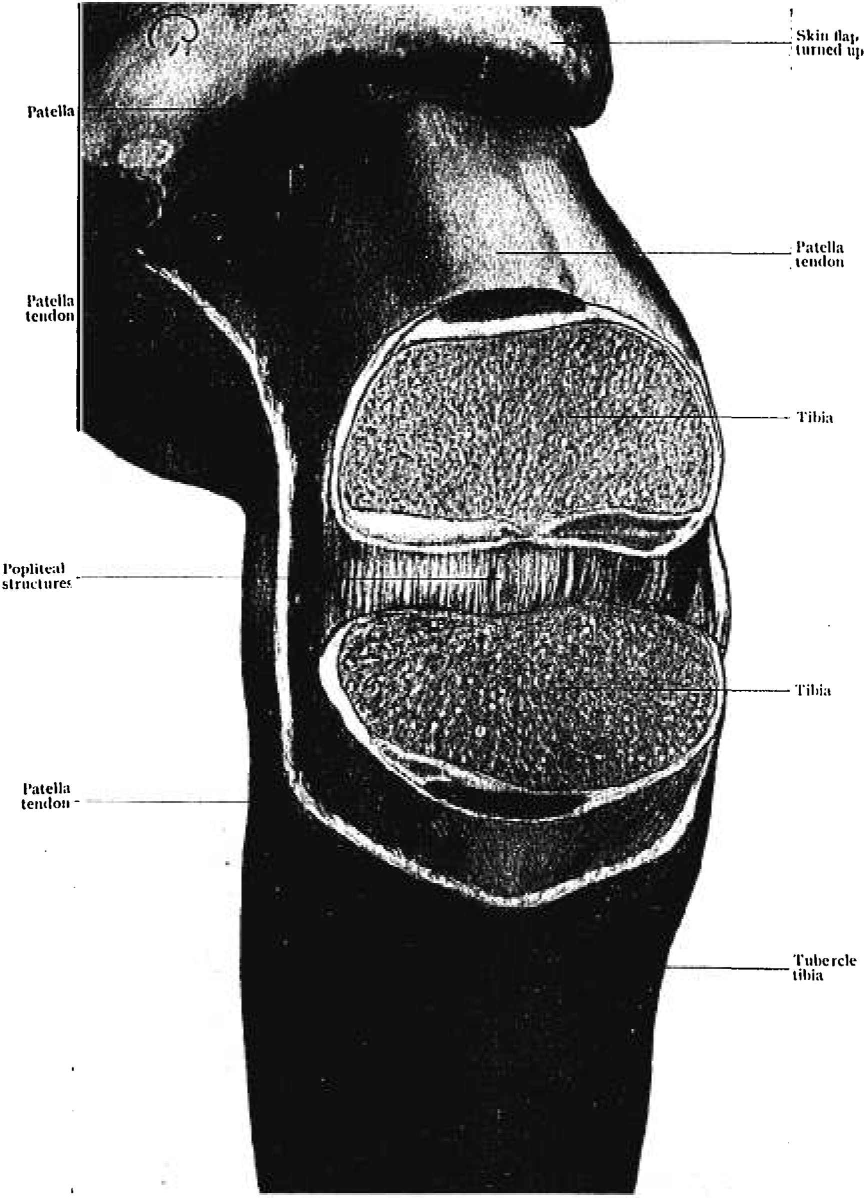

FIG. 4.—Tibia sawn through. Leg flexed. Structures at knee above fallen into place.

portion of the joint not removed serves as a starting point for fresh ravages of the disease. Kocher's method does not open the joint, but is subject to the other disadvantages.

It has seemed desirable to the writer to perfect some technique which did not open the joint and which would do away with the above-mentioned annoyances, and at the same time combine the advantages both of operations which do open the joint and of Kocher's method. It is my opinion that the following operation fulfils these requirements:

The skin incision should be rectangular, the two vertical cuts being well back at the sides of the leg, extending from a little above the level of the upper limit of the subcrural bursa to one inch below the joint line. These two vertical incisions are connected across the front of the tibia by a transverse incision (Fig. 1). This rectangular skin flap with the subcutaneous tissue is reflected upward.

The next incision is curved, the concavity upward. It starts in the vastus internus a little above the upper limit of the subcrural bursa and is carried down and outward in the direction of the muscle fibers to the tendon of the quadriceps extensor, one-half inch above the patella, and from here upward and outward in the direction of the fibers of the vastus externus to a point corresponding to the beginning on the inner side. The muscle with the tendon is completely divided and turned upward, thus exposing to view the subcrural bursa. We next make two small incisions on either side of the femur, starting on each side of the patella in the incision just described, and carried downward and backward to the joint line. The one on the inner side divides the tendinous expansion of the quadriceps, the one on the outer side the tendinous expansion and part of the iliotibial band. After completing these incisions the subcrural bursa is separated from the femur with the knife and turned down, tilting the patella when not adherent. The last incision in front is carried transversely across the front of the tibia down to bone just below the joint line (Fig. 2).

On the inner side the sartorius and gracilis are pushed back; on the outer side the biceps and peroneal nerve.

A flat retractor about one inch wide is now introduced on the inner side behind the head of the tibia close to the joint line. It is first introduced vertically between the gracilis and sartorius on one side and the tibia on the other. These muscles are pried off and the retractor brought to a horizontal plane, the apex passing behind the tibia. This retractor is now pushed outward always close to the bone until it emerges at the outer side. All soft parts are thus held back.

The next step is to saw through the tibia as close to the joint as circumstances seem to warrant, the leg being still flat on the table; the retractor being in place protects the soft parts (Fig. 3.)

The saw-cut through the head of the tibia is used as a joint. The femur is flexed on the body, the leg on the femur (Fig. 4), and with a large knife the soft parts are quickly separated from the posterior structures of the joint. By a little downward traction on the leg combined with the pull of its own weight injury to the vessels is easily avoided. This seems to be much more easily accomplished in this manner than by the operation which attacks the posterior structures of the joint from the anterior aspect. One has at least a better sense of security because one is perfectly sure of the relation of the vessels to the knife.

As soon as the posterior region of the condyles is exposed the femur is sawn through from behind forward and slightly downward at a level sufficient to clear the cartilage behind (Fig. 5.) This saw-cut is carried forward until it reaches the margin of the cartilage on the anterior surface of the femur, and the saw then withdrawn. The direction of this cut should be downward and forward so as to lose as little as possible of the femur and obtain the desired slightly flexed position of the bones subsequently. It is easy to be deceived as to the exact position of the cartilage behind. One's examination should be particularly careful at this stage of the opera-

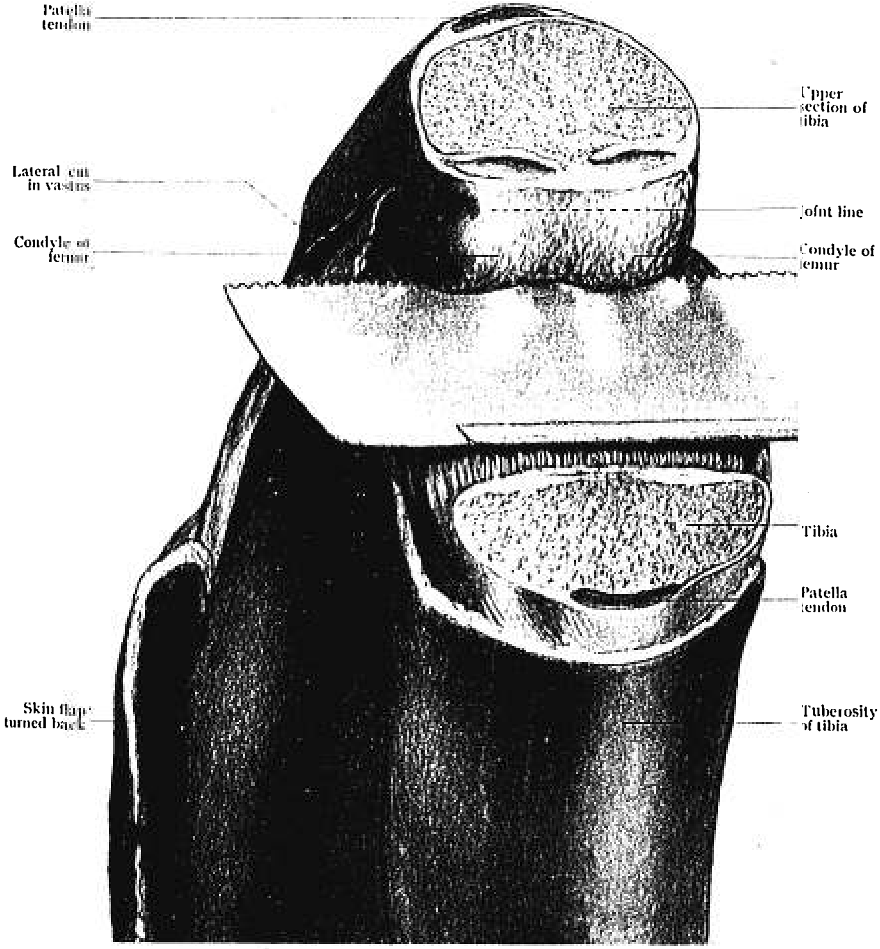

FIG. 5—Leg flexed on thigh—Condyles exposed. Saw in place for section of femur.

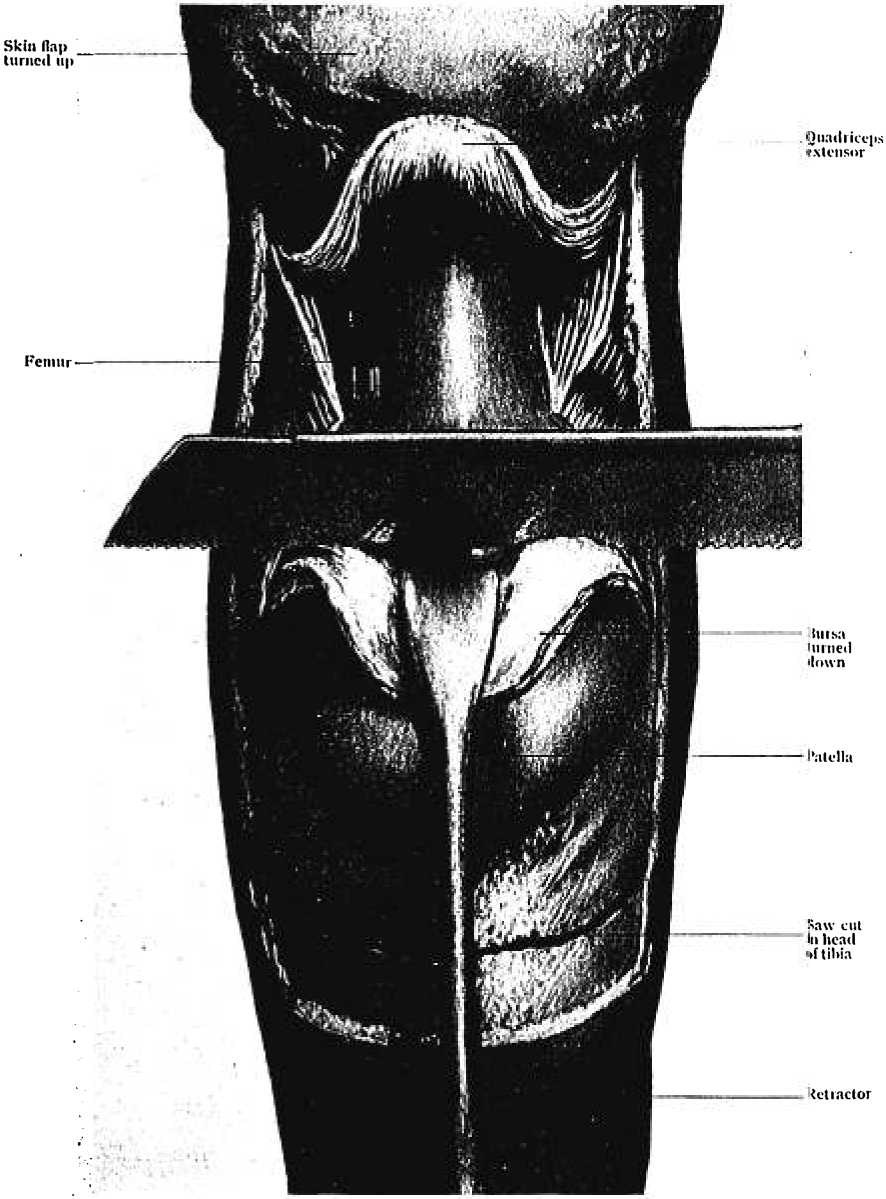

Fig. 6.—Leg horizontal. Bursa pulled down. Saw in place to remove trochlear surface of femur.

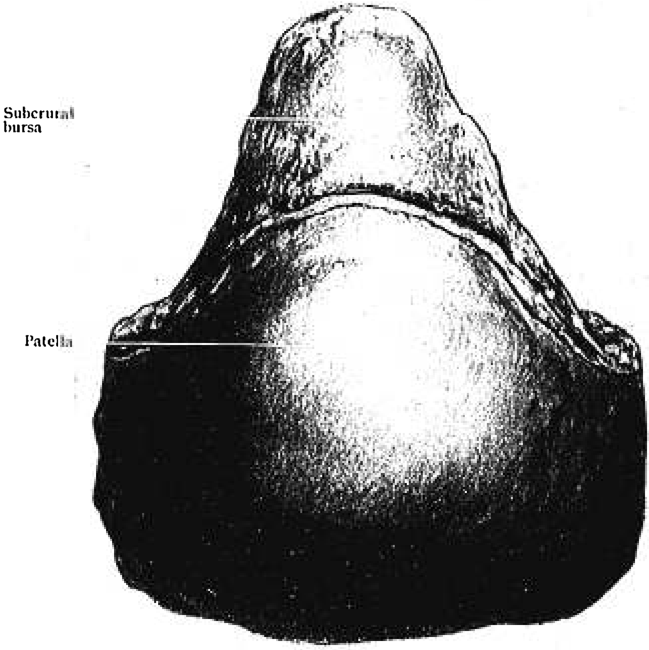

FIG. 7.—Joint removed without opening.

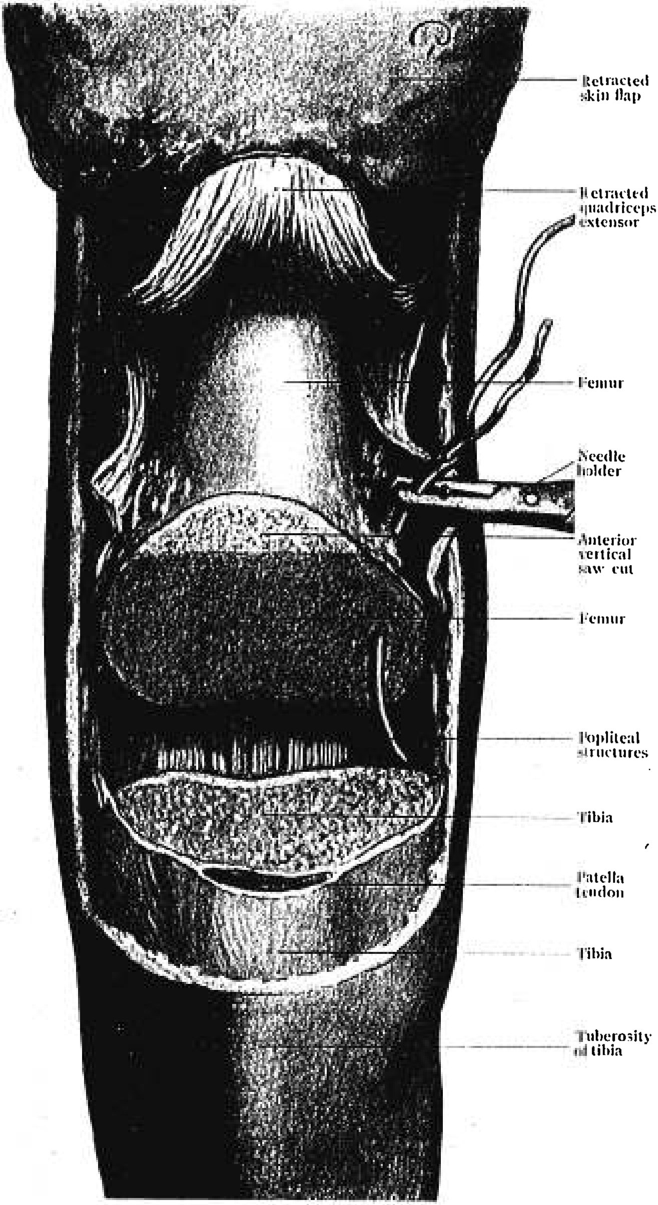

FIG. 8.—Joint removed—Hagedorn needle passed through femur.

tion, otherwise the saw-cut in the femur will be too high up.

After withdrawing the saw from the femur the leg is once more placed in a horizontal position. The saw is introduced behind the subcrural bursa at the upper margin of the articular cartilage on the front of the femur and a cut made which will meet the anterior limit of the horizontal saw-cut made from behind (Fig. 6). This last cut is almost vertical, in the coronal plane, and allows the articular portion of the femur which extends upward in front to be removed with the joint.

This is the last step of the incision proper, for it is now possible to lift out the joint with the patella and subcrural bursa, the articular surfaces of femur and tibia, all complete without having opened the joint (Fig. 7). Up to this point a tourniquet is used, but inasmuch as this part of the operation takes but little time, in fact about ten minutes, and in easy cases six minutes, we do not see the disadvantageous effects of longer use such as would be necessary to obtain complete hæmostasis in an operation which opens the joint transversely or dissects off the structures little by little. On removal of the tourniquet the bleeding points can be quickly clamped and tied, thereby reducing hemorrhage to a minimum.

The subsequent steps of the operation differ in no way from those hitherto customary.

The writer unites the bones with No. 4 chromic catgut, six stitches passed directly through the bone with a large curved Hagedorn needle (Fig. 9). It is usually unnecessary to bore holes. The cortical portion of the lower part of the femur and upper region of the tibia is so thin that it can readily be penetrated by a needle. The needle goes slowly at first and should be held in the holder about one inch from the point so as not to break. (See Fig. 8).

When examination of the cut ends of the bones reveals such an amount of disease left behind as to render curetting inadequate and demand removal of another piece of bone, then we are liable to get into the region where the cortex is so thick as to make this method of suture impracticable. In such a case we are obliged to resort to a drill.

After the suture of the bone the muscle and skin flaps are turned down and sutured in place. As a rule the amount of retraction in the rectangular skin flap about compensates for the shortening due to resection, so that secondary trimming of the skin is not necessary.

While suturing bone and soft parts and during the time the plaster dressing is being applied the leg should be carefully held in proper position by an assistant.

There are of course extreme cases either with very little tuberculous disease or with very extensive involvement where this operation would not be feasible.

This method of resection has the following advantages:

1. It is quick.

2. There is very little danger of contamination of the wound by tuberculous or other infection from the joint.

3. Hemorrhage can be reduced to a minimum.

4. The operation is thorough, there being but slight chance of leaving diseased tissue behind, thereby diminishing the probability of recurrence.

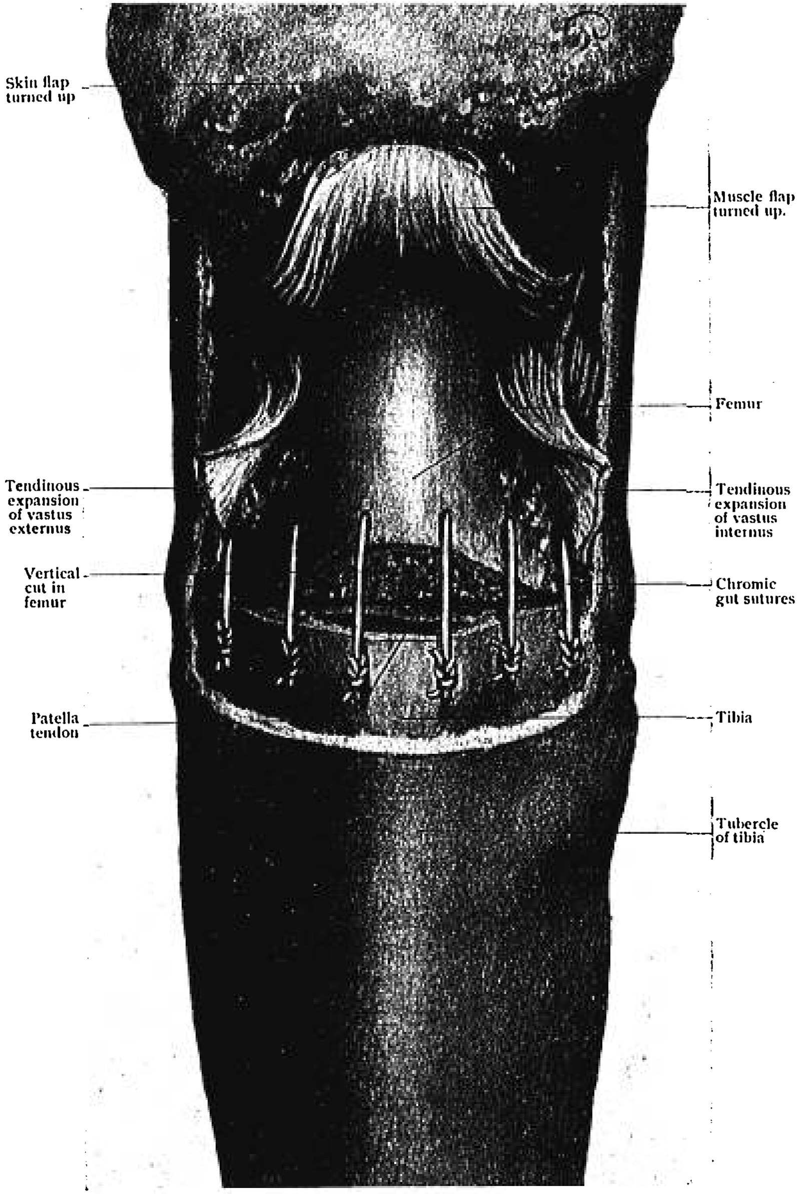

FIG. 9.—Femur and tibia approximated. Sutures in place.